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ABSTRACT

Writers often must summarize others' texts as part of their own work. To succeed at this, they must first read and understand new information and then transform that information to fulfill a specific purpose. Concept mapping, used as a visual organizing technique, can be an effective link between the two processes. In a preliminary study, students in an undergraduate technical writing class were given a three-part, paper-based module on summarizing texts. Each part introduced the concepts of metacognitive reading strategy (defining the task, monitoring understanding, mentally organizing the material), summarizing strategy (selecting material to include, formulating topic sentences, polishing one's paraphrase), and concept mapping. Students read and mapped three texts and wrote summaries of two of the texts. Students completed concept maps of the text before writing summaries, and as part of the mapping tactic, they were instructed to label the links between ideas. The three-part unit did function successfully as an instructional tool. The students who completed all three parts of the unit produced summaries that were well-organized and that transformed the original material by combining ideas across sentences and paragraphs. Used as an in-class exercise, however, the unit took enough class time that future trials may involve take-home exercises as well. (Contains 13 references.) (AEF)

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ED 408 955

Linking Reading And Writing: Concept Mapping As An Organizing Tactic

Rionda Osman-Jouchoux

Abstract

A pilot study of an instructional unit on summarizing technical texts suggests that reading strategies and concept maps can be used effectively by undergraduate technical writing students. The strategies chosen were simple heuristics based on theoretical descriptions of the processes successful readers and writers use. Concept maps provided a transition between the two sets of strategies, allowing learners to organize their understanding of the text.

When writers successfully summarize texts, they must first read and understand new information and, then, transform that information to fulfill a specific purpose. Concept mapping, used as a visual organizing technique, can be an effective link between the two processes.

In a preliminary study, students in an undergraduate technical writing class were given a three-part, paper-based module on summarizing texts. Each part presented instruction on metacognitive reading strategy, summarizing strategy, and concept mapping. Students read and mapped three texts and wrote summaries of two of the texts. As part of the reading strategy, students completed concept maps of the text before writing summaries. As part of the mapping tactic, students were instructed to label the links between ideas. Those students who completed the maps with labeled links generally wrote summaries that effectively transformed information.

This paper describes the development of the pilot module, including the reading strategies and the cognitive processes involved in writing summaries. Then, the linking function of cognitive maps is discussed. Finally, the conclusions and speculations this study provided and the implications for further study are discussed.

Summarizing — The Problem

Over several semesters students in an undergraduate technical writing class have had difficulty producing summaries of texts. Many of their summaries consisted of truncated sections of the original text; many ignored important ideas and emphasized relatively obscure points. It appeared that many of these students did not understand the material they read and, so, were unable to transform the ideas into coherent, concise renditions of the text.

The instructional unit developed to address this problem presents the task of summarizing technical texts in two steps. First, learners are instructed to read the text purposefully and, then, to write a summary of the text guided by prompts. To connect the two sets of strategies, learners were asked to construct concept maps of the text as a way to organize the knowledge gained from reading the text and to gain an overview of the information to be summarized.

This unit was designed to present simple, almost intuitive strategies that encourage learners to consider their tasks and to monitor their understanding. These goals were formulated from the research literature. From that literature we know that learning strategies can enhance learning (see, for example, Dansereau, 1985). We also know that often learners do not use learning strategies even though we think they should.

Garner (1990) has addressed the problem of failure to use learning strategies, and her reasons that learners do not use strategies include:

- often learners do not monitor their learning, either because they do not understand how to evaluate what they are doing or too many demands are made on memory resources.

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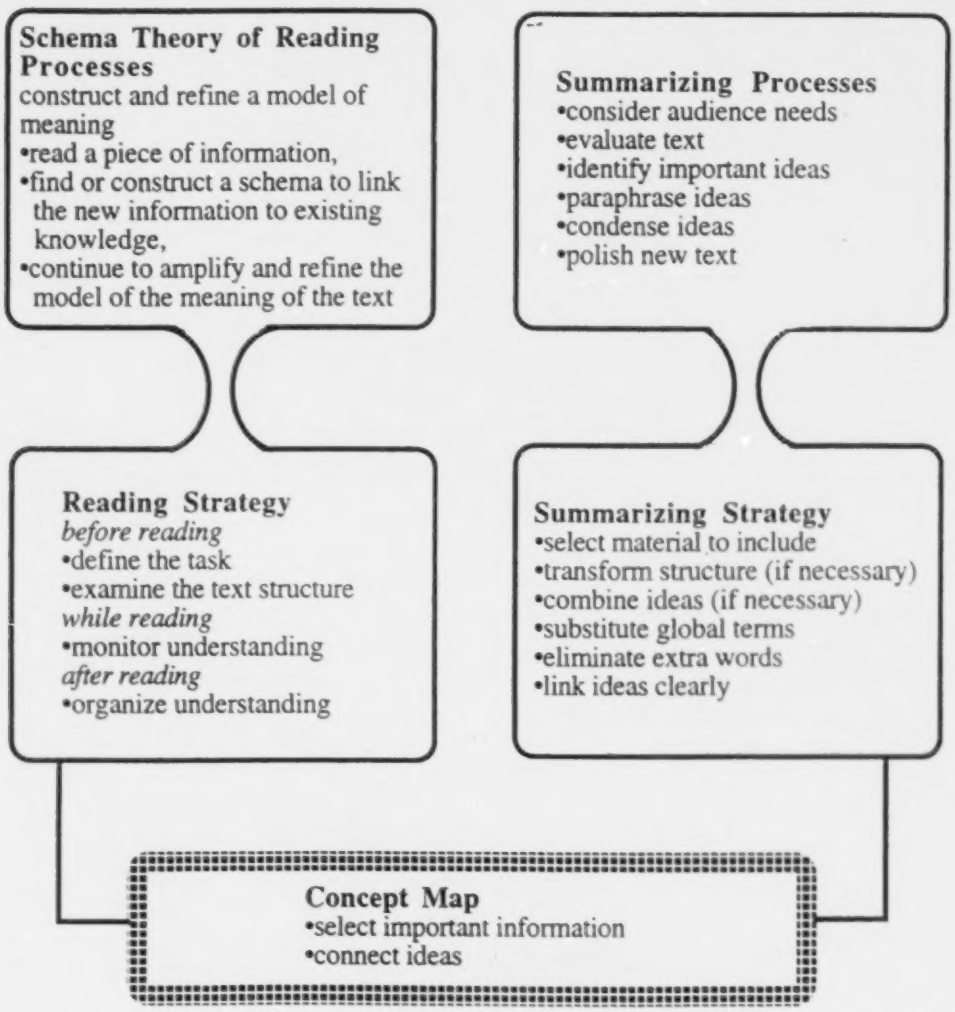
- learners often have work habits that are successful in some situations, and they are reluctant to abandon routines.
- learners may lack the in-depth knowledge base that would enable them to use higher reasoning when they encounter new information.
- learners often experience instructional situations that discourage trying out strategies.
- often learners acquire a strategy in a specific set of circumstances and are then unable to transfer that skill to other circumstances.

The strategies developed for the summarizing unit consist of simple heuristics designed to guide the learner through the processes good readers and writers are presumed to use. See Figure 1.

Figure 1
Reading and summarizing processes and strategies linked by concept maps



Garner's (1990) concerns were taken into consideration in developing these strategies. Readers are prompted to define their task, to examine the text's structure, and to set goals for themselves. Readers are prompted to be aware of portions they do not understand. The unit provides encouragement to break habits, and the extremely general nature of the prompts should not discourage transfer to other circumstances.

Reading Strategy

Schema theory provides us with a description of the process of meaning-making. A reader reads new information and activates an existing mental schema, or creates a new one, that allows the reader to connect new information to the already known. Then, as pieces of information are added, a mental model that represents the meaning of the text is constructed and refined. Reading, then, is a process of acquiring information and relating new to known knowledge.

From this description of reading, we can recognize the processes good readers use: they examine the structure of the text, they set goals for their reading and their learning, they check on their understanding as they go along, and they evaluate their understanding. (For one account of the processes of good and weaker readers, see Pearson and Raphael, 1990.)

The reading strategy presented in the summarizing unit calls upon readers:

before reading
  to define their task
    — why am I reading this? what do I need to get from this text?

while reading
  to monitor their understanding
    — do I understand this passage? why not? do I need more information?

after reading
  to organize their understanding
    — do I understand this material? how do the parts relate to each other? does this new information fit with what I already know?

Figure 2 reproduces a page of the summarizing unit. The text is presented on the right, and the reading strategy cues are on the left.

Summarizing Strategy

Summaries and the abilities needed to produce them have been of interest to several research teams (Brown, Campione, & Day, 1981; Brown & Day, 1983; Brown, Day, & Jones, 1983; Winograd, 1983) who have found that, developmentally, summarizing is a late-developing skill useful in investigating higher-order comprehension problems of good and poor readers.

However, Hidi and Anderson (1986) pointed out that writing a summary of an existing text is fundamentally different from other writing tasks. When producing original text, we plan content and structure and generate ideas and details in a pattern of activity that continually shifts among these tasks. When writing summaries, we must comprehend and evaluate existing texts and condense and transform the ideas we find there.

Writers of effective summaries:

select material to include
  — is this trivial information? redundant information?

select or write topic sentences
  — should I maintain the original structure? can I combine these ideas? is this structure accurate with respect to the original?

paraphrase and polish
  — can I substitute a global term for a list? can I eliminate extra words? are these ideas clearly linked?

We can view the processes used in reading technical material and writing summaries through the early theoretical work on self-regulated learning of Corno and Mandinach (1983). They provide a framework that describes necessary activities when learners are learning most effectively. Specifically, when learners are comprehensively engaged, they acquire knowledge by the processes of attending,

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Figure 2
A page from the summarizing unit, Part 3

Make notes here	<NIC.MERIT.EDU> /introducing.the.internet/intro.to.ip
Consider your purpose in reading this text.	Introduction to the Internet Protocols
Is this text appropriate to your purpose? Is it authoritative? What kind of information do you think it will give you?	Computer Science Facilities Group
What questions do you think the text will answer?	RUTGERS
	The State University of New Jersey
	3 July 1987
	This is an introduction to the Internet networking protocols (TCP/IP). It includes a summary of the facilities available and brief descriptions of the major protocols in the family.
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Look at the structure.	
Note the headings and subheadings.	Unix is a trademark of AT&T Technologies, Inc.
What did the author think was important?	Table of Contents
How is this text organized?	1. What is TCP/IP?
What will be the most interesting sections?	2. General description of the TCP/IP protocols 2.1 The TCP level 2.2 The IP level 2.3 The Ethernet level
	3. Well-known sockets and the applications layer 3.1 An example application: SMTP
	4. Protocols other than TCP: UDP and ICMP
	5. Keeping track of names and information: the domain system
	6. Routing
	7. Details about Internet addresses: subnets and broadcasting
	8. Datagram fragmentation and reassembly
	9. Ethernet encapsulation: ARP
	10. Getting more information
	Portions of Section 2 and all of Sections 3, 4, 5, 6, 7, 8, 9, and 10 have been omitted.

rehearsing, monitoring, strategic planning. They then transform that knowledge by the processes of selecting, connecting, and tactical planning.

Concept Mapping

Transforming information is a process common to both making concept maps and writing summaries. Concept maps provide a flexible format for graphic representation of concepts and the relationships among them (Jonassen, Beissner, & Yacci, 1993; Novak & Gowin, 1984).

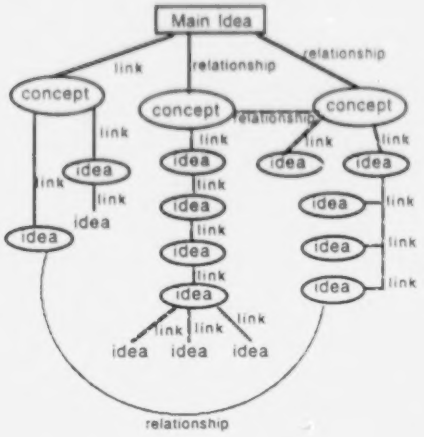
Visual organizers, in general, can be defined as graphic representations of different kinds of thinking processes (Clarke, 1991). Concept maps are a form of visual organizer that, as Clarke has pointed out, supports both inductive and deductive thinking.

In reading strategies, maps allow readers to organize their understanding of the text, including that obtained from the macrostructures of texts. When used in prewriting strategies, concept maps allow learners to

organize their knowledge and develop their writing for an audience. By explicitly organizing their understanding of a text, writers of summaries should be positioned to transform information to the needs of a particular audience instead of using the most common strategy of presenting a sequential, abridged recapitulation of the text.

In the summarizing unit, learners were instructed to write the main idea of the text at the top of a sheet of paper. Then they wrote secondary ideas or subconcept below the main idea. Each subconcept was to be linked to the main idea and the link labeled to explain the relationship between the concepts. Each subconcept was to be described as completely as possible, and the links clearly defined. See Figure 3.

Figure 3
Generic example of a concept map



The Summarizing Unit — The Pilot

The goals for the pilot study were to determine:

- whether this approach allowed sufficient opportunity for students to become proficient with the strategies
- whether this approach took up too much time
- whether a metacognitive approach to reading as well as writing would address the summarizing difficulties of students
- whether the mapping tactic provided an opportunity for students to consolidate their learning or distracted from the task

The unit was used by students enrolled in an upper division technical writing class during Spring semester 1996. The three-part unit was used during class time. Part One required students to read a short text on learning style preferences, make a map of the text, and complete a learning style inventory. Part Two required students to read a short text defining the Internet, make a map of the text, and write a 200-word summary for a group of employees of a database company. Both Parts One and Two were completed in class. Part Three required students to read a much longer, more complex text describing TCP/IP protocols, make a map of the text, and write a 200-word summary for the same audience. Students received participation points for the first two parts, and the summary produced in the third part was graded. Figure 4 displays a map of a text, and Figure 5 displays annotated samples of summaries.

Fifteen students completed all three maps and both summaries. The unit contains written instructions for producing a map, and the class completed a map on the board after the first unit.

Both summaries received comments on the degree to which they were logically organized, addressed audience awareness issues, and were polished. Organizational problems and audience awareness issues occurred rarely. The polish of these summaries elicited the most comments.

These categories for comments reflect issues that writers must address; however, they do not tell us about the processes of summarization. When writers present information in the original sequence, often that form of organization is appropriate for a summary. In short pieces, audience awareness issues can be obscured. While learners are expected to polish their writing, in this case the first summaries (Part 2) were written in class; the second summaries

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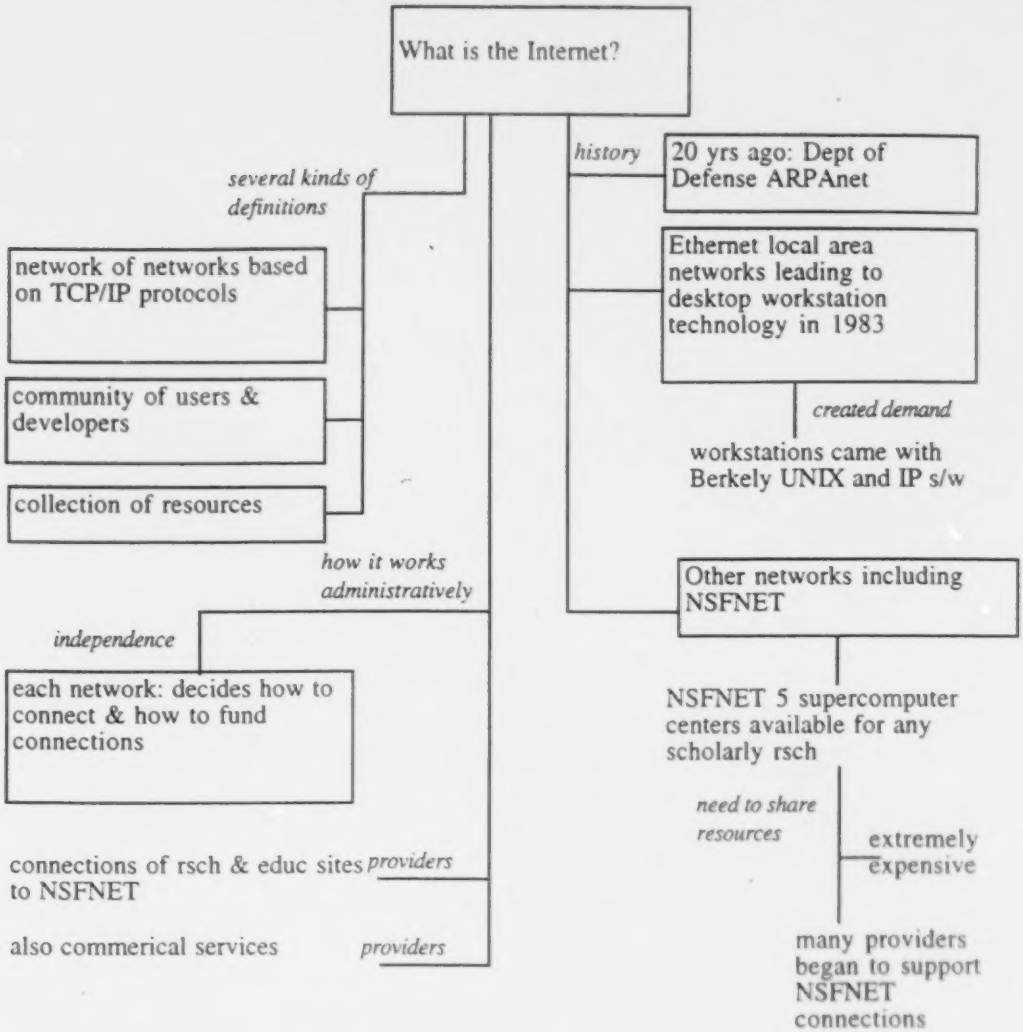
Figure 4
Concept Map of Text to Summarize (Part 2)


What is the Internet?
history
20 yrs ago: Dept of Defense ARPAnet
Ethernet local area networks leading to desktop workstation technology in 1983
created demand
workstations came with Berkely UNIX and IP s/w
several kinds of definitions
network of networks based on TCP/IP protocols
community of users & developers
collection of resources
how it works administratively
Other networks including NSFNET
NSFNET 5 supercomputer centers available for any scholarly rsch
need to share resources
extremely expensive
many providers began to support NSFNET connections
independence
each network: decides how to connect & how to fund connections
connections of rsch & educ sites to NSFNET
providers
also commerical services
providers

(Part 3) were take-home assignments, and the quality of transitions, usage, and flow was improved.

Conclusions and Speculations

The three-part unit did function succesfully as an instructional tool. It seemed to provide enough repetitions of the strategy instruction to allow students to use it well in the third part.

Used as an in-class exercise, however, the unit took a significant amount of class time. To be more acceptable to other instructors, the unit should be modified to be take-home exercises augmented by in-class discussions and explanations.

The technical writing students who completed all three parts of the unit produced summaries of the texts that were well-organized and that transformed the original

Figure 5
Examples of Summaries from Part 3

	Comments
In laymen's terms, TCP/IP is a set of protocols that allow computers to share resources across a network. There are various vendors that support TCP/IP services.	combination of ideas across several paragraphs.
The more traditional services that TCP/IP offer are file transfer, remote log in, and computer mail. These services provide users to get and send files, log in from a different computer, and send messages to other computers.	polish issue: proofreading condensation of several paragraphs
More of the modern services are TCP/IP are remote print, remote execution, name server, terminal servers, and network-oriented windows system. These services allow a user to print from a remote printer, run a program on a different computer, file user names and passwords, allows small computers to run protocols, and programs to display on different computers. Both traditional and modern services are applied to all of the computers on the network.	polish issue: proofreading condensation of several paragraphs organizational issue: Should last sentence be the topic of the next paragraph?
These protocols are able to work by commands that have a logical progression. Each protocols runs off of the other. For example, the main commands feeds off of another set of commands.	polish issue: proofreading unclear paraphrasing of the protocols' interdependence
If more information is desired you can consult RFC, or Request for Comment. This will give you the answer you are looking for.	polish issue: punctuation audience awareness issue: will readers have access to the RFC?

	Comments
Computers, like people, have many different languages. When people want to communicate effectively, they must first agree on which language to speak. Computer networks operate the same way. For computers to communicate effectively, they need to follow a defined set of commands, or "protocols", that each system can understand. Once computers are able to "talk", they can share resources and perform certain tasks. Two of the most commonly used protocols are TCP and IP. Since these two protocols are often used in conjunction with one another, they are sometimes referred to, concurrently, as TCP/IP or IP/TCP. Some of the tasks they help perform are:	audience awareness issue: opening provides a simile that demystifies the technology
•file transfer - allows you to send files to or get files from another computer. •remote login - allows a user to login on any computer on the network. •sending mail - allows you to send mail messages to other users on the network.	organizational issue: only traditional services are listed, no recent developments are included
In short, TCP/IP allows you to expand your resources and working environment beyond your individual PC. With the help of these protocols you can access more powerful programs and expedite information more rapidly.	

material by combining ideas across sentences and paragraphs. Several were reluctant to label relationships among the ideas in their maps, and the first efforts of these students tended to present more information verbatim, with less effort to make transitions between ideas.

These differences in the summaries may be explained by the amount of effort that the writers put into their maps. As Corno and Mandinach's (1983) theory of self-regulated learning suggests, learners adapt the level of effort and the ways in which they acquire (attending, rehearsing, monitoring, strategic planning) and transform (selecting, connecting, tactical planning) information to the situation.

In the most involved mode of learning, comprehensive engagement, learners use all the learning processes and skills optimally. When learners are focused on a task, they emphasize transformation processes of selecting important information, connecting new information to already known, and making tactical plans to achieve the task. When learners are presented with situations that either encourage or force them to manage their resources, they expend effort in finding ways to avoid all or part of the effort (such as working with others to share work). When learners are in a passive position, such as a lecture situation, they receive information and avoid transforming processes.

Possibly, the summarizing process calls upon learners, first, to be comprehensively engaged to read the text and understand it thoroughly. They must, then, be focused on the task of producing the summary.

A follow-on study is being conducted that will try to examine the relationship between student effort and the quality of summaries. This study will investigate the following questions:

1 Do learners who use concept maps as metacognitive organizing strategies produce summaries of technical material that reflect transforming processes?

2 Does the level of learner engagement in construction of the concept maps affect the transforming processes found in their summaries?

In the proposed study, the mode of construction of the concept maps will be varied according to the type of learner effort required: entirely learner-constructed or pre-constructed. Examination of performance differences should reveal whether the writers are selecting important information, discarding irrelevant information, and making connections between ideas.

Summaries in the follow-on study will be examined for transformations in much the same way Winograd (1983) rated summaries of good and poor writers. Transformations, derived from those used by Winograd (1983) and Brown and Day (1983), include:

- paraphrases of ideas rather than verbatim copies of portions of text
- combinations of ideas across paragraphs
- substitutions of global terms for lists of items

We can speculate that readers who thoroughly understand the text they are summarizing would be more likely to produce paraphrases, combine ideas, and substitute global terms. We can also speculate that those writers who expend the effort to select important ideas and to make explicit the connections among the ideas, as they do when constructing a concept map, would more thoroughly understand the text. If that is the case, concept mapping would be an effective organizing tactic in metacognitive learning strategies.

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